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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/957,395	09/19/2001	Anisul Khan	AM5782	4481
7590	11/23/2004		EXAMINER CULBERT, ROBERTS P	
Patent Counsel APPLIED MATERIALS, INC. P.O. BOX 450A SANTA CLARA, CA 95052			ART UNIT 1763	PAPER NUMBER

DATE MAILED: 11/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/957,395

Applicant(s)

KHAN ET AL.

Examiner

Roberts Culbert

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10/29/04.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5,9-15 and 21-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,9-15 and 21-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Response to Arguments***

Applicant's arguments with respect to the prior art rejections have been considered but are not persuasive to overcome the rejections as recited below.

Applicant has argued, "*Claim 1 recites limitations not taught or suggested by Sugiyama. Sugiyama does not teach or suggest depositing a core material on said first insulating layer to fill said opening, wherein said core material contacts said semiconductor layer along a side of said opening, as recited by claim 1. Therefore, Sugiyama does not teach or suggest all of the limitations of independent claim 1 and all claims depending therefrom.*"

The argument is not persuasive because Sugiyama reads on claim 1 as amended. Referring to Figure 4C, Sugiyama illustrates a semiconductor layer comprised of semiconductor materials 12, 13, and 17 and further teaches that an opening is formed through this composite layer to insulating layer 10. In Figure 5A, Sugiyama illustrates that the core material contacts the semiconductor layer along a side of said opening.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-5, 9-15, and 21-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no support in the specification or drawings for the limitation "*wherein said core material contacts said semiconductor layer along a side of said opening*". In every example provided in the specification and drawings, the core material is surrounded on both sides by a deposited conformal layer.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claim 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,307,242 to Sugiyama.**

Sugiyama teaches a method of making an optical waveguide, comprising providing a substrate (Fig. 4A) comprising a semiconductor layer (12, 13 and 17) disposed on a first insulating layer (10); forming an opening through said semiconductor layer to said first insulating layer (Fig. 4C); depositing a core material (11) on said first insulating layer to fill said opening (Fig. 5A); removing excess core material (Fig. 5B); such that an upper surface of the core material is substantially even with an upper surface of the semiconductor layer (Compare Figures 5A and 5B) and depositing a top cladding layer (14) over the core material.

Regarding Claim 2, the semiconductor layer comprises at least one material selected from the group consisting of silicon, silicon-germanium, gallium arsenide, indium gallium arsenide and indium phosphide.

Regarding Claim 3, the semiconductor layer is silicon. (Col. 5, Line 11)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1-4, 13, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,307,242 to Sugiyama in view of U.S. Patent 6,553,170 to Zhong et al.**

As applied above, Sugiyama teaches the method of the invention substantially as claimed, but does not teach that the first silicon oxide-insulating layer (10) and the top silicon oxide-cladding layer (14) each have a different refractive index. However, it is well understood in the waveguide fabrication art that the top and bottom cladding layers may have a different refractive index as long as both layers have a lower refractive index than the core layer. Zhong, for example, teaches a method of forming a waveguide having top and bottom cladding layers each with a different refractive index. The top clad (411) is Boron doped, and the bottom clad (412) is SiO<sub>2</sub> (Col. 5, Lines 3-5). It would have been obvious to one of ordinary skill in the art at the time of invention to form the cladding layers of Sugiyama each with a different refractive index in order to improve the re-flow characteristics of the top clad layer and thereby improve the gap-filling properties of the top clad as taught by Zhong (Col. 2, Lines 55-61).

Note that the first silicon oxide-insulating layer (10) of Sugiyama reads on a bottom cladding layer disposed in the opening as broadly recited in Claim 13.

**Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,307,242 to Sugiyama in view of U.S. Patent 6,553,170 to Zhong et al. and in further view of U.S. Patent 3,934,061 to Keck et al.**

As applied above, Sugiyama in view of Zhong teaches the method of the invention substantially as claimed but does not teach that the bottom cladding layer is formed of glass.

Sugiyama does teach that the bottom cladding layer is made from SiO<sub>2</sub>, which may be glass. Nevertheless, Keck teaches that the use of glass for cladding layers is old and well known in the waveguide fabrication art. It would have been obvious to one of ordinary skill in the art at the time of invention to form the cladding layer using the conventional materials such as glasses.

**Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,307,242 to Sugiyama in view of U.S. Patent 6,282,358 to Hornbeck et al.**

As applied above, Sugiyama teaches the method of the invention substantially as claimed but does not teach that the excess core material is removed by chemical mechanical polishing. Sugiyama, however, does teach that the excess core material may be removed by polishing (Col. 6, Lines 13-16). It may be assumed that polishing in Sugiyama refers to chemical mechanical polishing as this technique is routinely used in the waveguide fabrication art. Hornbeck, for example teaches that CMP is used to remove excess core material after deposition in a trench. (Col. 7, Lines 48-61) It would have been obvious to one of ordinary skill in the art at the time of invention to use CMP to remove the excess core material in the conventional manner.

**Claims 9-12, 15 and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,307,242 to Sugiyama.**

As applied above, Sugiyama teaches the method of the invention substantially as claimed but does not explicitly teach that the layer (9) is a second insulating layer. However, since Sugiyama teaches that the substrate is a SOI (Silicon on Insulator) substrate (Col. 5, Lines 54-56) it would have been obvious to one of ordinary skill in the art that layer (9) of Sugiyama is an insulating layer, since SOI

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substrates are conventionally formed from a silicon layer on one or more insulating layers which are typically formed from silicon oxide or silica glass. Official Notice is taken of the fact that SOI substrates are conventionally formed from silicon on insulating layers such as silicon oxide and glass as stated above and are routinely used in the waveguide fabrication art. It would have been obvious to one of ordinary skill in the art at the time of invention to form the silicon on insulator substrate in the conventional manner using a second insulating layer comprising silicon oxide or silica glass.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (571) 272-1433. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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